12-2011

Geo-referencing Imagery on Jupiter's Moon, Io

Meghan Elizabeth Burris
University of Redlands

Geo-Referencing Jupiter's Moon, Io

Meghan Burris, Ruijin Ma Ph.D., MS GIS Program, University of Redlands

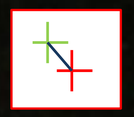
PROJECT

Geo-referencing images of Io, Jupiter's closest orbiting satellite, using five different transformation methods to determine which method is the most accurate. Each transformation was tested with 21 control points. A check point error analysis was also conducted to determine the error between the basemap and the geo-referenced image.

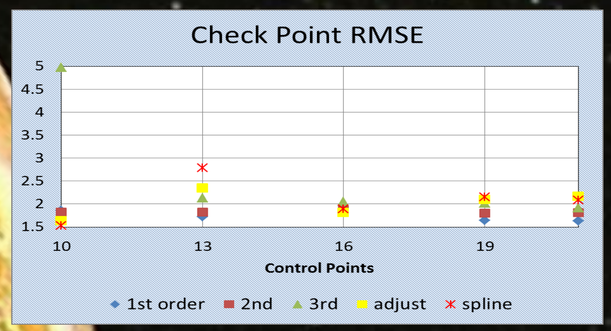
The five methods of geo-referencing are shown to emphasis the deformities and displacement. Adjust and Spline have zero control point error, control points are not shown in order to see the transformation better.

Method	Minimum GCPs	Equation	Accuracy Model
1st Order	3	Linear	Global
2nd Order	6	Parabolic	Global
3rd Order	10	Cubic	Global
Adjust	3	TIN*, Linear	Global, Local
Spline	10	TIN*, Cubic	Local

TIN*: Triangular Irregular Network



Green crosshair shows the original selected point, red crosshair shows the projected point after the formula is applied and the Blue line shows the error between the two crosshairs.



RESULTS

Check point error was determined by selecting ten control points that stayed constant. Then the check points were selected starting with ten and increasing by three each time. The chart shows the error amounts as the check points increase for each transformation.

CONCLUSION

The polynomial transformations can cause discontinuous lines and major deformities if the control points are not chosen carefully and are not accurately placed along the border of the image. Adjust transformations is a piecewise function that uses 1st order polynomial equation and the TIN method. This can still cause discontinuous lines on the image. Spline manipulates the image like a sheet of rubber. It is also a piecewise function that uses TIN and 3nd order polynomial, yet each triangle is adjacently effected thus causing a smoother transition across the entire image. Overall, each method is a reasonable transformation method except for the 3rd order polynomial.